

DESIGNING SENSORY E-TEXTILES FOR DEMENTIA

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Abstract:

This paper describes research investigating the design and development of new kinds of sensory textiles to be used to support the subjective wellbeing (SWB) of persons with dementia (PwD). An international collaborative research project is presented in which participatory and inclusive design methods have been used, informed by the expertise and experience of a variety of stakeholders including carers, occupational therapists, PwD and their families.

Research methodologies, based on relationship centred care and positive design approaches, are qualitative and include case studies, recorded interviews, documentary photography and practical participatory workshop sessions. Early findings from the research in the form of prototype textile design solutions are presented; these include embedded technology, which extend the sensory properties of the proposed garments. The paper evidences the benefits of using a collaborative and open style of design research that encourages fun, exploration and joyful cooperation to address the global challenge of creatively designing for an ageing population.

Keywords: *Design, dementia, sensory textiles*

1. Introduction

The research described in this paper aims to contribute new knowledge and propose practical solutions to enhance the wellbeing of people with late stage dementia through the development of sensory textiles known as '*Dementia Aprons*'. The World Health Organisation has identified the challenge of caring for the elderly, especially those with dementia, to be made a public health priority at international and national levels. It states that enabling the ageing population to maintain healthy ageing and wellbeing is a social and economic imperative. The number of people living with dementia worldwide is currently estimated at 35.6 million, this number will double by 2030 and more than triple by 2050 ("Ageing and lifecourse," 2014). The G8 Dementia Summit (London, December 2013) gave a commitment to 'build an international effort to approach the problem of dementia together'.

This paper describes the first phase of participatory research; it builds on findings from the authors' three previous funded research projects concerning craft, wellbeing and playfulness and the 'Making a Difference' research project, supported by funding from Welsh Assembly Government, OPAN (Older People and Ageing Network) and HEFCW (Higher Education Funding Council Wales). These projects have led to the formation of an extensive international research development network comprising occupational therapists, elder care managers and staff, dementia nurses, charities, care providers, service users and their carers. Many from this group of supporters have been participants in workshop events and have acted in an advisory capacity; their insights, expertise and practical contribution to the research have been invaluable.

The research described is an international, interdisciplinary collaboration that includes researchers from University of Technology Sydney Australia (UTS), Birmingham City University, Swansea University, led by researchers at the Centre for Applied Research in Inclusive Arts and Design (CARIAD) Cardiff Metropolitan University. The link with Australia provides international collaboration with leading researchers in the field as well as opportunity to scope, develop, test and disseminate the research on a global stage. Australia has recognised the importance of non-clinical approaches to general health and is at the forefront of developments in Arts Health research. The Faculty of Arts and Social Sciences at UTS leading the way in exploring interdisciplinary approaches to social care and health related research. The aim is to continue to undertake research in both countries; building on each other's experiences, ideas and findings through shared data, evaluation and dissemination opportunities. It is hoped that this will result in a stronger, co-operative, global response to the urgent need for research in the field identified by the World Health Organisation and the G8 nations.

The global challenge of an ageing population has yet to be fully embraced by the design community as evidenced in the dearth of bespoke products for the care of people with dementia. The increase in numbers of old people has implications not only for the individual but also for society as a whole, including infrastructure requirements and national and international economic decision-making. Health professionals, carers and families are increasingly looking for creative and cost effective ways to support the positive health and wellbeing of PwD (Lee and Adams, 2011). These challenges present opportunities for designers to creatively enhance life through socially responsible and appropriate design solutions. The project described in this paper is harnessing the expertise and experience of occupational therapists, care providers, people with dementia and their families through inclusive participatory methods in order to identify and address design challenges that will enhance everyday life and increase subjective wellbeing of people with dementia.

This paper describes a design process that is purposefully playful and open ended. It approaches 'design creativity' as an everyday capability of participants and uses their professional expertise to shape the insights and creative leaps acquired during physical making with materials and craft techniques (Dorst and Cross, 2001). The focus on playful participation and a sense of joy in making has been used to shape the design process: to stimulate and motivate group creativity and promote an inclusive co-design experience. The first phase of participatory research is described, which builds on findings from the authors' three previous funded research projects concerning craft, wellbeing and playfulness and the 'Making a Difference' research project, supported by funding from Welsh Assembly Government, OPAN (Older People and Ageing Network) and HEFCW (Higher Education Funding Council Wales). These projects have led to the formation of an extensive international research development network comprising occupational therapists, elder care managers and staff, dementia nurses, charities, care providers, service users and their carers. Many from this group of supporters have been participants in workshop events and have acted in an advisory capacity; their insights, expertise and practical contribution to the research have been invaluable.

2. Context, Aim and Objectives

The research described in this paper uses theories of relationship-centred care (Nolan et al., 2003) and *positive design* (Desmet and Pohlmeier, 2013) to scope the development of textile designs for sensory wearables using emerging technologies that enable and promote sensory stimulation to support SWB. The focus of the design challenge is therefore, to develop interactive designs that stimulate the senses, promote positive emotion, bring comfort in both an individual and social context.

Many people are able to age in good health and remain active participants in society, however the physical and cognitive limitations as a result of dementia mean that many lose the ability to live independently. Support is required not only for physiological needs but also to maximize the potential for people to socialise, have fun and enjoy their lives. Research indicates that happy people live longer, retain their independence, and require less medication and social care (Huppert et al., 2005). There are therefore, personal, social and economic imperatives to finding new tools and strategies to promote positive emotion, social inclusion and foster wellbeing in later life. In 2010, the *National Dementia Declaration for England* captured outcomes that are needed to live well with the condition (Alliance, 2010) and the *Prime Minister's Challenge* expressed the need to build dementia friendly communities (Health, 2012). The focus on *wellbeing* and *living well*, rather than physical and medical care, will be a challenge for many social care providers. Design solutions that can help support elderly people, especially those with dementia, to live well and enjoy life are urgently needed.

Playful activities have been found to support subjective wellbeing (Woodyer, 2012; Rogerson et al., 2013) The concept of using playfulness as a strategy for caring for people with dementia is becoming more widely accepted in the UK and Australia (Killick, 2013). The applicant's previous research has highlighted differences between what is considered by society as 'play' and those activities that are 'playful' (Rogerson, Treadaway et al., 2013). It has shown that it is the ludic, intrinsic *playfulness* in leisure activities that are able to reduce stress and support wellbeing. Ludic playfulness supports subjective wellbeing (SWB) by encouraging living in the moment, sensory awareness, absorption and provides new mental spaces that stimulate imaginative thinking (Woodyer, 2012). Previous research indicates that social interaction and a sense of belonging in society are vital to SWB (Huppert et al., 2005). Playfulness also supports ways of socially engaging with others through shared play spaces, either physical or imaginary. Fiddling, fidgeting and fingering are playful activities that continue well into late stage dementia (Stephens et al., 2013). They can help calm, comfort and stimulate PwD who often instinctively fiddle with their own clothing or those of others in their proximity. By 'designing-in' opportunities to fiddle, touch and explore, designs can be developed to engage and amuse people who are often difficult to care for and frequently marginalised.

3. Research Methods

A '*positive*' design research approach underpins the mixed methodology that is described here (Desmet and Pohlmeier, 2013). Positive design methods are based on the principles of positive psychology and involve the explicit intention of designing to support human flourishing. The method takes account of pleasure, personal significance and virtue as core design values. Initial research has been undertaken to gather personal histories and understand the nature of the degeneration in cognitive ability that occurs in late stage dementia. Close relationships have been established with care professionals, managers, carers and families of PwD to inform the design research, through visits and interviews at a number of elder care homes. Testing and evaluation of SWB is problematic since it involves self-reporting of internal responses, therefore evaluation methods will inevitably be largely qualitative. Use of new toolkits, such as the Wellbeing Measures Toolkit (Thomson and Chatterjee, 2013) are proposed for use in the next stage of the project.

The qualitative methods used in the project are participatory and inclusive (Blessing and Chakrabarti, 2009) and involve a range of stakeholders including care professionals, academics, medical practitioners and service providers. Participants have been drawn from the international network developed by the authors during previous funded research and in particular will include one of the leading social care providers in Wales and the project partner: Gwalia Cyf. The occupational therapist from Gwalia is working closely with the research team at all stages in the research. Age Cymru - My Home Life, Alzheimer's Society (UK and Australia), Dementia Positive, NHS, Arts and Health Australia and Arts Health Institute, Australia contribute professional support and advice.

4. Design Creativity in Practice: Dementia Aprons Hack Funshop

4.1 Case studies and context

Sensory textiles are currently being used with PwD to provide stimulation and distraction within care homes in South Wales. These *dementia aprons* (Fig.1) are over-garments, which contain stimulating surfaces and attachments for fiddling and touching, including buttons, beads, zips and pockets in assorted colourful and patterned fabrics. The few that exist are bespoke garments that have been designed and made for specific PwD by textile artists, carers and occupational therapists. The design challenge was to reimagine the design of these garments to include the potential integration of electronics and digital technology in order to provide greater personalisation and stimulation, possibly through sound and vibration. The existing garments are designed for women and, therefore, a further design challenge was to create garments suitable for men with dementia.

The first stage of the research involved a series of case study visit to four residential care homes in South Wales to meet with carers, family members of PwD and occupational therapists. A series of recorded interviews were made along with documentary photographs of the original dementia aprons. These over-garments, all made for women with dementia include visual and tactile imagery that is gendered and personalised. For example an apron made for a woman who enjoys knitting includes digitally printed imagery of knitting patterns from the 1950's, chunky buttons and hand knitted sections. An apron, made for a woman who enjoyed dressmaking in her younger days, included zips and ribbons as well as dressmaking pattern imagery printed onto the surface of the cloth.

Research team members interviewed care staff and family members in order to identify and gather information about specific PwD to design for during the proposed participatory design workshop. Three specific people were identified: two men and a woman. A description for each was written in advance of the workshop identifying their individual preferences, interests and a little life history.

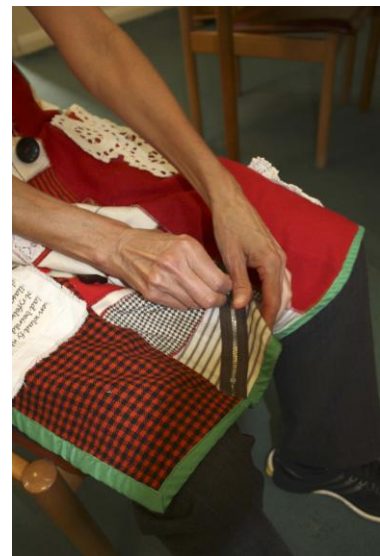


Figure 1. Dementia Apron

4.2 Hack Funshop

The participatory workshop was described as a Hack Funshop with the aim of ensuring that the event was fun, creative and inclusive; less about work and more about enjoying the challenge of developing innovative ideas. The Hack Funshop brought together 30 participants from Singapore, Australia, Wales and England and 10 organisations, including Gwalia, Age Cymru, Arts Fission, University of Technology Sydney, Swansea University and CARIAD, Cardiff Metropolitan University. The participants were from a range of disciplines including health care professionals, art and design, and technology and comprised:

- Occupational Therapists, (OTs) care managers, carers, and charity representatives
- Designers, textile artists, a choreographer and researchers
- Technologists, computer scientists, engineers and members of the Hack Space community

The event was held in the Textile department at Cardiff School of Art and Design, Cardiff Metropolitan University. The facilities comprised three large flat tables facilitating collaborative work for groups of 8-10 people with access to a range of textile materials, technology in the form of electronic kits, coders and database designers, tools and equipment including digital sewing machines. Participants were arranged in three groups, each with a mix of technologists, textile expertise and those who had experience of working with PwD.

The workshop began with an introduction outlining the need for sensory garments to be used in the care of people with late stage dementia. This included visual examples of existing dementia aprons already being used in care homes locally. Participants were asked to consider the event as an opportunity for blue skies thinking and to explore the potential for technology and digital connectivity through the embedded electronics within textile wearables for PwD to extend possibilities for enjoyment, fun and interaction. Participants were given a brief written profile of one of the three selected PwD, which included their likes, dislikes and needs. This information challenged participants to create specific designs for real individuals, as opposed to designing generically for PwD. The OT responsible for the care of the people profiled was present at the event and was able to provide further information throughout the day.

4.3 The design stage

The three groups consisted of 10 participants and each approached the design problem in different ways. Group 1 (designing for a PwD called John) chose to work in a relaxed environment, and share personal experiences before committing ideas to paper. The group worked with a theme of pockets exploring concepts of identity and surprise. The main focus of this group was on ensuring that the PwD would be comfortable with the design of the garment and the selection of appropriate materials was for them particularly important. The final design was a sensory blanket with pockets rather than an item of clothing since the group had been advised that this particular PwD objected strongly to wearing an apron (Fig.2). Great care and attention was paid to the textural qualities of the component parts, both the base cloth and the pockets. The proposed design was also to incorporate an easy to use digital camera as John had had an interest in photography as a younger man and the group felt that he would be likely to respond positively to images he captured himself viewed on a screen or tablet.



Figure 2. Dementia Blanket – John

The blanket was made of a relatively course plain cloth typically associated with male suiting fabric. The blanket had a number of large pockets that could easily be accessed by hands with limited dexterity. Inside the pockets were a number of items that might be found in the pockets of men's clothing including coins and nuts and bolts (stored inside tulle bags within the pocket to avoid the danger of swallowing). Inside a large fleecy pocket were a series of bright silk scarves tied together, which could be drawn out in the style of a theatre magician.

Group 2 focussed on working on a design for a PwD called Ado. They worked intensely, capturing written ideas on large pieces of paper developing a range of themes that they wished to represent in the design including Ado's preference for particular items of clothing, his various fields of employment and countries he had lived in. These themes were represented through bright silk scarves, the frontispiece of a blue business shirt, and a variety of men's suit fabrics (Fig 3). The textile elements within the apron were highly coloured and decorative incorporating stitched, knotted and embellished detail for fiddling with and to provide added sensory interest. In addition the blanket used conductive threads and fabrics to enable a soft contact switch to be embedded that could tap on and off with an easy hand gesture and produce light and sound responses.



Figure 3. Dementia Apron – Ado



Figure 4. Dementia Apron – Renee (detail of pocket)

Group 3 focussed on Renee's profile. They began by exploring the persona of the allocated person and thinking about her interests and personality. This group included an OT who had extensive experience working in a range of care facilities and was able to provide detailed regulatory/health and safety information from her experience of working and managing OTs in the National Health Service (NHS). She was able to focus discussion in the group on potential health issues such as infection control, health and safety regulations and the need to be able to wash garments. These insights led to the group developing a modular approach to ensure that elements of the design could be removed before the garment was washed. The modular concept influenced the overall design of the apron. Members of the group developed pockets representing different design elements that could be exchanged and removed depending on the mood of the person at any one time (Fig. 4). The modules, created for a standard apron style wearable garment, included a pocket that could be attached to the apron that held shells (safely enclosed within a silk fabric), and used fabrics suggestive of sea and sand, with a detachable woven 'beach ball'. A second attachment depicted an image of a cat with a fur head and knitted woollen body (Fig. 5). The cat motif contained embedded electronics so that when the head was stroked it vibrated to suggest a cat purring. The final element produced was a constructed fabric piece that consisted of a series of fabric switches that played a variety of musical sounds as fabric elements were touched or stroked.

Some participants were particularly motivated by the materials and fabric manipulation, which enabled them to develop and clarify their thinking through the making process. Others in this group focused on drawing and planning their ideas on paper before making. The technologists gravitated towards this group and three of them worked together to overcome technical problems with the electronics (AdaFruit Gemma and Lily Pad Arduino) and to create interactive elements. In addition to playing sounds, the electronically embedded constructed textile attachment acted as a feed to a database connected to an iPad, which could collect related images from the internet and stream them,

in close vicinity of the PwD, together with appropriate sounds and music. The modular approach provided a customisable and personalisable design solution.

4.4 Producing Useful Prototypes

The aim of the Hack Funshop was to explore design concepts, however all three groups decided to make a completed dementia apron that could be used with a PwD by the end of the event, in preference to presenting prototypes, ideas or samples. The afternoon session became a creative frenzy, with all participants engaging not only with their own group but also other participants and on many levels. This involved sharing expertise and learning new skills, including the use of sewing machines and learning about electronics. The plan for the final half-hour of the Hack Funshop was for a feedback session to share findings and experiences from the day's activities. However, all groups were reluctant to stop work and so the final session comprised of only a fifteen-minute 'show and tell' in which finished ideas were shared with the group. These presentations were video recorded and photographed for the research, to explain the design concepts and show how the embedded technology added sensory interest to the garment. While all groups completed a wearable on the day, all had greater ambitions for their dementia apron that were not feasible within the time allocated in the Hack Funshop.

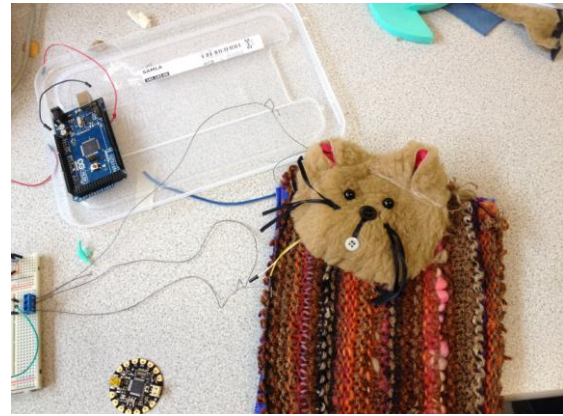


Figure 5. Purring cat pocket with embedded electronics

All the designs presented at the end of the day required some final textile stitch finishing before PwD could be given them. They also required further work consolidating and embedding the electronics. The Hack Funshop did, however, provide an opportunity to present proof of concept for all three designs and indicated the potential of the technology to extend the sensory properties of the aprons and provide a degree of personalisation. Further research is required to explore the difficulties surrounding the health and safety/ infection control/ and laundering of garments embedded with electronics although health professionals attending the event supported the idea that this might be achieved using a modular system in which components could be easily removed before washing. The potential to personalise garments using cloud based data sets and wireless technology was considered possible and further work to test this idea is proposed. One of the difficulties of designing sensory aprons is the time involved and expense required to make an apron appropriate for a particular individual. By embedding wireless technology to access an individual's personal data (e.g. musical preference, family photographs) there is potential to design and manufacture a range of generic yet personalisable textile apron designs for PwD.

5. Discussion and Future Research

The aims of the Hack Funshop were to explore creative and fun ways to design objects and interactive experiences to promote fun and 'in the moment joy' for PwD. The Hack Funshop event highlighted the need to take into account the range of stakeholders impacted by the health and positive wellbeing of PwD and their views and concerns. This project evidences the ways in which the experiences of a wide range of people who are affected by dementia, (family member or friends, carer, or health care professional), can provide designers with valuable insights and a wealth of information in creating, not only objects for play, fun and joy, but also opportunities for moments of engagement and interaction. The Hack Funshop modelled ways in which individuals can experience, fun and joy, through stimulation of the senses (sight, sound and touch) by engaging with other people, making or touching processes, and interaction with physical materials and embedded electronics. In promoting fun and joy for the participants in the Hack Funshop, the aim has been to bring to the fore the experience of fun and joy, and for this to inform design creativity and making process. In addition, the

format of the Hack Funshop provided an opportunity to cascade knowledge through participants, enabling them to initiate similar events in order for best practice design processes to be broadly employed to reach the greater community of people impacted by dementia.

All Hack Funshop participants expressed a desire to continue the research and willingness to participate in a research development group to seek further funding. It was suggested that a future event might take place within a dementia unit in a residential care home and include PwD, family members and carers. Funding has now been secured for the next phase of the project, which will include the evaluation of the products designed and made in the Hack Funshop. In particular, the next phase of the research will interrogate the emotional reaction of the participants receiving the textiles, using a variety of evaluation techniques including smile recognition, physical engagement and other qualitative indicators of subjective wellbeing.

References

- Alliance DA. (2010) National Dementia Declaration for England. UK: Dementia Action Alliance, 8.
- Blessing LTM and Chakrabarti A. (2009) *DRM, a Design Research Methodology*: Springer.
- Desmet PMA and Pohlmeier AE. (2013) Positive design: An introduction to design for subjective well-being. *International Journal of Design*, 7: 5-19.
- Dorst, K. and Cross, N. 2001. Creativity in the design process: co-evolution of problem solution. *Design Studies*, 22, pp425-437.
- Health Do. (2012) Prime Minister's challenge on dementia. In: Health Do (ed). London: GOV.UK.
- Huppert FA, Baylis N and Keverne B. (2005) *The science of well-being*, Oxford: Oxford University Press.
- Killick J. (2013) *Playfulness and dementia : a practice guide*, London: Jessica Kingsley Publishers.
- Lee, H. & Adams, T. (2011) *Creative approaches in dementia care*. Houndmills, Basingstoke, Hampshire, Palgrave Macmillan.
- Nolan M, Davies S, Brown J, et al. (2003) Beyond 'person-centred' care: a new vision for gerontological nursing. *International Journal of Older People Nursing in association with Journal of Clinical Nursing* 13: 45-53.
- Rogerson R, Treadaway C, Lorimer H, et al. (2013) Permission to Play: taking play seriously in adulthood. *AHRC Connected Communities Reports*. Swindon: AHRC, 11.
- Stephens A, Cheston R and Gleeson K. (2013) An exploration into the relationships people with dementia have with physical objects: An ethnographic study. *Dementia* 12: 697 - 712.
- Thomson L and Chatterjee H. (2013) UCL Museum Wellbeing Measures Toolkit. London: AHRC, 28.
- Woodyer T. (2012) Ludic Geographies: not merely child's play. *Geography Compass* 6: 313-326.
- Ageing and lifecourse. (2014). World Health Organisation, from http://www.who.int/ageing/projects/knowledge_translation/en/